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09/943,029	08/29/2001	Sang-Hyun Lee	19570-05384	9521

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EXAMINER	
TORRES, JUAN A	

ART UNIT	PAPER NUMBER
2631	

DATE MAILED: 06/15/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/943,029	LEE ET AL.	
	Examiner	Art Unit	
	Juan A. Torres	2631	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *02 May 2005*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-9* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-9* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *02 May 2005* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Drawings

The drawings were received on 05/02/2005. These drawings are accepted by the Examiner.

Specification

The modifications to the specification were received on 05/02/2005. These modifications are accepted by the Examiner.

Response to Arguments

Applicant's arguments filed on 05/02/2005 have been fully considered but they are not persuasive.

The Applicant contends, "Claims 1, 4 and 6 were rejected under 35 U.S.C. 102(e) as being anticipated by Bergmann (U.S. Patent No. 4,821,297). Claim 9 was rejected under 35 U.S.C. 102(e) as being anticipated by Hogge (U.S. Patent No. 4,218,771). Applicant respectfully traverses for the following reasons, but reserves the right to swear behind these references at a later date.

Bergman apparently discloses a digital clock recovery scheme. Included is reference clock used to provide a plurality of N signals with different clock phases. The incoming data stream is sampled and clocked with the reference clock to generate a plurality of M samples for each data bit. The logic values of the M samples are then analyzed to determine the relationship between the current clock phase and the data bit transition. If all samples agree, the clock phase is perhaps aligned with the data. If the clock phase is either leading or lagging the data, various samples will disagree. In the

latter situation, the clock phase is adjusted until all samples agree, the particular clock, which provides this state thus being defined as the recovered clock signal.

Hogge apparently discloses an automatic clock positioning circuit for positioning a clock pulse for a digital data stream that resembles an eye pattern when seen on an oscilloscope in response to digital data when the sweep is equal to the baud, bit or clock rate. Included in the circuit is a timing source for providing a stream of clock pulses and a controllable phase shift means electrically connected to said timing source and in response to an error signal will either advance, delay or maintain the phase of said stream of clock pulses. Also included is a pseudo-error indicator means for providing an upper, lower, early and late boundary condition within the center of the eye pattern of the digital data stream and providing a first pseudo-error signal for each violation of the upper or lower boundary condition by the eye pattern at the early boundary condition and a second pseudo-error signal for each violation of the upper and lower boundary condition at the late boundary of the eye pattern, means for integrating the first and second error signals, means for comparing the integrated first error signal with the integrated second pseudo-error signal providing an error correcting signal; and means for controlling the controllable phase shift means with the error connecting signal.

Aspects of the claimed embodiment are directed to methods and systems for data recovery for a digital stream of input data such that a plurality of sampling clocks are employed to maintain optimal placement of a 'valid data' region within an eye opening that results from a superposition of multiple data transitions. Each sampling clock of the plurality of sampling clocks is independently and automatically adjusted to

maintain optimal placement of the valid data region. For example, the valid data region may need to only be adjusted on the left side due to an asymmetrical jitter distribution. Instead of adjusting the entire valid data region, which would result in the right side of the region being too far over, just a sampling clock that defines the left boundary would be adjusted. This process can also be done for the right boundary or for both boundaries at the same time. Advantageously, the claimed embodiment allows for adjustment of the valid data region, as defined by a leading and trailing clock, as the shape of the jitter distribution changes as well as mere shift of the center of the distribution to the left or right. This unique behavior of the claimed embodiment is succinctly described in Applicant's specification at page 10, lines 3-20 and is reproduced here for the Examiner's convenience:

"The term 'predetermined margin' indicates that the phases of 'CLK1' and 'CLK3' do not exactly coincide to the edge of the data eye. The data eye is related to the probabilistic distribution of jitter. Furthermore, the phase controller has a low pass filter, which makes the phases of 'CLK1' and 'CLK3' determined by the past history of random jitters on the data.

[0028] In the present invention, 'CLK2' 308 is controlled by a phase control signal that is determined from the difference of the bit-error-rate measured at 'CLK1' 307 and the one measured at 'CLK3' 309. 'CLK1' 307 and 'CLK3' 309 are advanced and delayed from 'CLK2' 308 by the time difference of 'TM' 310, respectively. The time difference 'TM' 310 is controlled by another phase control signal that is determined from the summation of the Go bit-error-rate. If bit-error-rate at 'CLK1' 307 is greater than the one

at 'CLK3' 309 it means that the overall sampling phase leads the eye opening. Therefore, the phase of 'CLK2' 308 is delayed until the two bit-error-rate becomes equal. On the contrary, if the bit-error-rate at 'CLK1' 307 is smaller, the phase of 'CLK2' 308 is advanced. If the sum of the Go bit-error-rate exceeds a predetermined value, 'TM' 310 is decreased to shrink the sampling window to the eye opening. If the sum is less than predetermined value, 'TM' 310 is increased."

In marked contrast, both Bergman and Hogge disclose methods of maintaining an optimal clock position in an eye of a jitter distribution via fixed valid data regions. That is, the leading and trailing sample clocks that define the valid data region are pre-defined at a set and equal distance on either side of the data clock. If the valid data region, or conversely the eye opening moves, to either side then both Bergman and Hogge will make an adjustment of the valid data region as a whole in the appropriate direction to correct the phase imbalance. Disadvantageously, both Bergman and Hogge are simply not capable of adjusting the size of their valid data region.

To further illustrate, Applicant respectfully draws the attention of the Examiner to Bergmann, column 3, line 63 to column 4, line 17 that is reproduced here:

"Referring to FIG. 2, a timing diagram is shown of incoming data. The clock signal is represented by the vertical lines. The locations of RD1, RD2, and RD3 for each data bit are indicated by their respective numerals in FIG. 2. For this particular example, RD1 may represent the 10% interval of the data bit, RD2 the 50% interval, and RD3 the 90% interval. Other interval values for RD1 and RD3 may be used, for example, 25% and 75%, respectively. In accordance with the teachings of the present invention,

however, the middle sample value must be chosen at or near the 50% interval since this position of the data bit will most likely represent the correct data bit value regardless of the initial misalignment of the clock. Therefore, RD2 is utilized as the retimed data output of recovery arrangement 10. For the particular situation illustrated In FIG. 2, data samples RD1, RD2 and RD3 will always be identical in value, since the phase of the clock is correctly synchronized with the data stream. That is, the RD1-RD2-RD3 inputs to decision circuit 18 will either be "1-1-1" or "0-0-0." Provided with this input, decision circuit 20 will transmit a "no change" output signal to phase selector 22."

Bogge's out of phase alignment system is dependent on the spacing of the "RD" marks in the timing diagram. Alignment is achieved when a specific pattern is detected. The "RD" marks can perhaps be adjusted but then that would perhaps require the pattern to be changed accordingly to properly detect alignment. The spacing of the RD marks are not automatically changed in response to a change in the width of the timing pulses.

Hogge also discloses a similar type of system that is dependent on the eye pattern moving out of a specified and fixed window such as that described by Hogge at column 3, lines 36-48:

"There is established an upper boundary condition 16 and a lower boundary condition 17 in the eye pattern. The timing pulses .tau..sub.2 as shown by waveform 7 in FIG. 1 establish the early boundary condition 19 while the delayed boundary condition 20 is established by the delayed timing pulses .tau..sub.1 of waveform 11 of FIG. 1. Under ideal conditions, the clock or timing pulses associated with each data bit will occur in the

center of the eye pattern. However, when a side 14a, 14b, 14c or 14d of the eye pattern crosses the boundary conditions established by the upper boundary 16, the lower boundary 17, the early clock pulse .tau..sub.2 at 19 or the late clock pulse .tau..sub1 at 20, then a pseudo-error occurs."

Bogge specifies that the eye pattern is out of alignment when the upper boundaries 16 and 17 intersects with eye pattern boundaries 14a, 14b, 14c or 14d. No disclosure is made of adjusting these various boundaries in response to a change in the shape of the eye pattern.

Claim 4 depends directly from independent claim 1 and is allowable at least for the reasons set forth for that independent claim. Withdrawal of the rejections of claims 1, 4, 6 and 9 is respectfully requested."

The Examiner disagrees and asserts, that, as indicated in the previous office action in the case of the present application and in the case of the reference of Bergmann the phase shifting means output 3 sampling clocks (CLK1, CLK2 and CLK3) and contrary what the applicant claims now, the phase different between 'CLK2 415 and 'CLK3' 416 is the same as that between 'CLK1' 414 and 'CLK2' 415, so each clock is not independently adjustable. This is expressed for example in paragraph [0028], [0034], [0037], etc.. :

"[0028].... **`CLK1` 307 and `CLK3` 309 are advanced and delayed from `CLK2` 308 by the time difference of `TM` 310, respectively**. ...."

"[0036] ....Therefore, the phase difference between `CLK2` 415 and `CLK3` 416 is the same as that between `CLK1` 414 and `CLK2` 415"

"[0037] ... Bundle of clocks 906 that lag 905 in phase are input to multiplexer (II) 909, where one of those is selected so that the phase difference between `CLK2` 415 and `CLK3` 416 is the same as that between `CLK1` 414 and `CLK2` 415 ..."

If the applicant means that independently refers to CLK1 and CLK2 with CLK3, Bermann discloses exactly the same thing with a CLK2 having the phase $\emptyset_n$ and to CLK1 the phase $\emptyset_{n+x}$ CLK3 the phase $\emptyset_{n-x}$.(see figure 6 column 7 lines 13-40)

The discussion shall be focus only in the claims not in the disclosure.

The Applicant contends, "Claims 2-3 and 7 were rejected under 35 U.S.C. 103(a) as being unpatentable over Bergmann in view of Hogge. Claims 5 and 8 were rejected under 35 U.S.C. 103(a) as being unpatentable over Bergmann in view of Hogge and further in view of Epstein (U. S. Patent No. 3,663,115).

Bergmann and Hogge were previously summarized. Epstein apparently discloses a digital voltage controlled oscillator ("VCO") to produce an output clock having a given repetition frequency comprising a source of the input clock, first means to generate a local clock having a repetition frequency equal to a given multiple L of the nominal value of said given repetition frequency and to generate at least a first timing signal having a given activation interval wherein L is an integer of one. Also included is a second means coupled to the first means responsive to the local clock and to the first timing signal to produce the output clock. The VCO further includes a third means coupled to the source, the first and second means responsive to the first timing signal and the phase relation between the input clock and the output clock to control the production of the output clock to follow the phase variation of the input clock.

Since claims 2-3, 5 and 7-8 from independent claims 1 and 6, Applicant respectfully submits that these claims are also allowable at least for the reasons put forth in the previous section. Withdrawal of the rejections of claims 2-3, 5 and 7-8 is respectfully requested.

The Examiner disagrees and asserts, that, because the previous rejections to claims 1 and 6 are maintained the rejections to claims 2-3, 5 and 7-8 are also maintained.

Claim Rejections - 35 USC § 112

The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

Claims 1-8 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention. The specification discloses that the phase different between 'CLK2 415 and 'CLK3' 416 is the same as that between 'CLK1' 414 and 'CLK2' 415, so each clock is not independently adjustable. This is expressed for example in paragraph [0028], [0034], [0037], etc.. :

"[0028].... **`CLK1` 307 and `CLK3` 309 are advanced and delayed from `CLK2` 308 by the time difference of `TM` 310, respectively**. ...."

"[0036] ....Therefore, the phase difference between `CLK2` 415 and `CLK3` 416 is the same as that between `CLK1` 414 and `CLK2` 415"

"[0037] ... Bundle of clocks 906 that lag 905 in phase are input to multiplexer (II) 909, where one of those is selected so that the phase difference between `CLK2` 415 and `CLK3` 416 is the same as that between `CLK1` 414 and `CLK2` 415 ...".

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claim 1, 4 and 6 are rejected under 35 U.S.C. 102(b) as being anticipated by Bergmann (US 4821297).

As per claim 1 Bergmann (US 4821297) discloses a data recovery apparatus for a digital data stream of input data, comprising: phase shifting means for outputting a plurality of sampling clocks in a bit time, where the phase of each sampling clock of the plurality of sampling clocks are automatically and independently adjustable (figure 6 blocks 16, 14 and 38, column 7 line 21-40); data sampling means for sampling the input data using the sampling clocks as triggers, and for providing multiple sampled data signals, where one of the sampled data signals is used to output recovered data (figure 6 blocks 32, 34 and 36, column 7 line 18-21); compare logic means for comparing the sampled data signals to the recovered data (figure 6 block 20, column 7 line 41-45); and phase controlling means for estimating the phase relationship between the input data

and the plurality of sampling clocks using the comparison result of the compare logic means, and for providing control signals to the phase shifting means according to the estimation result (figure 6 block 20, column 7 line 41-45).

As per claim 4 Bergmann (US 4821297) discloses a phase shifting means comprising: a phase distributor outputting a plurality of phase shift values (figure 6 block 38, column 7 line 21-40); a buffer receiving input from the phase distributor and outputting a first sampling clock of the plurality of sampling clocks in accordance with a first output of the phase controlling means (figure 1 and 6 block 14 and 38 output, column 3 line 31-35); and selection logic receiving input from the phase distributor and outputting a second and third sampling clock of the plurality of sampling clocks in accordance with a second output of the phase controlling means (figure 6 block 38, column 7 line 21-22).

As per claim 6 Bergmann (US 4821297) discloses a data recovery apparatus for a digital data stream of input data, comprising: a phase shifter that outputs plurality of sampling clocks in a bit time, where the phase of each sampling clock of the plurality of sampling clocks are automatically and independently adjustable (figure 6 block 38, column 7 line 22-40); a data sampler that samples the input data using the sampling clocks as triggers, and for providing multiple sampled data signals, where one of the sampled data signals is used to output recovered data (figure 6 block 32, 34 and 36, column 7 line 17-21); compare logic that compares the sampled data signals to the recovered data (figure 6 block 20, column 7 line 41-45); and a phase controller that estimating the phase relationship between the input data and the plurality of sampling

clocks using the comparison result of the compare logic means, and for providing control signals to the phase shifting means according to the estimation result (figure 6 block 38, column 7 line 41-45).

Claim 9 is rejected under 35 U.S.C. 102(b) as being anticipated by Hogge (US 4218771). Hogge (US 4218771) discloses a data recovery method for a digital data stream, comprising: sampling input data at multiple points, where the sampling points are arranged by a predetermined order and adjustable time difference (figure 3 block 23 column 3 lines 49-60); providing a first pseudo bit-error signal that is a result of comparison of data sampled at an early boundary with recovered data (figure 3 block 33 column 3 line 60-65); providing a second pseudo bit-error signal that is a result of comparison of data sampled at a late boundary with recovered data (figure 3 block 35 column 3 line 66 to column 4 line 2); and using the first and second pseudo bit-error signals, so that the sampling boundary is marginally matched to the edge of an eye opening and one of the intermediate sampling points serves for data recovery (figure 3 block 51 column 4 lines 3-13).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claim 2-3 and 7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Bergmann (US 4821297) as applied to claim 1 above, and further in view of Hogge (US 4218771).

As per claim 2 Bergmann (US 4821297) discloses claim 1. Bergmann (US 4821297) also discloses a phase shifting means comprising: phase delay means controlled by a first output of the phase controlling means for outputting a first sampling clock of the plurality of sampling clocks using an input clock which is one of an external clock and an internally recovered clock (figure 6 block 14, column 3 line 31-34); first circuit means controlled by a second output of the phase controlling means for outputting a second sampling clock of the plurality of sampling clocks that advances the first sampling clock in phase (figure 6 block 38, column 7 line 26-28); second circuit means controlled by the second output of the phase controlling means for outputting a third sampling clock of the plurality of sampling clocks that is delayed from the first sampling clock in phase (figure 6 block 20, column 7 line 24-25); Bergmann (US 4821297) doesn't disclose that the phases of the three sampling clocks are arranged within an eye opening of the input data stream with a predetermined margin even that is inherited in his description. Hogge (US 4218771) discloses that the phases of the three sampling clocks are arranged within an eye opening of the input data stream with a predetermined margin (figure 2 and 3, column 3 line 49-51). Bergmann (US 4821297) and Hogge (US 4218771) teachings are analogous art because they are from the same field of endeavor. At the time of the invention it would have been obvious to a person of ordinary skill in the art to incorporate the eye pattern disclosed by Hogge (US 4218771)

with the recovery scheme disclosed by Bergmann (US 4821297). The suggestion/motivation for doing so would have been to establishing a late clock boundary condition and an early clock boundary condition (Hogge (US 4218771) column 2 lines 51-53).

As per claim 7 Bergmann (US 4821297) discloses claim 6. Bergmann (US 4821297) also discloses a phase shifting means comprising: phase delay means controlled by a first output of the phase controlling means for outputting a first sampling clock of the plurality of sampling clocks using an input clock which is one of an external clock and an internally recovered clock (figure 6 block 14, column 3 line 31-34); first circuit means controlled by a second output of the phase controlling means for outputting a second sampling clock that advances the first sampling clock of the plurality of sampling clocks in phase (figure 6 block 38, column 7 line 26-28); second circuit means controlled by the second output of the phase controlling means for outputting a third sampling clock that is delayed from the first sampling clock of the plurality of sampling clocks in phase (figure 6 block 20, column 7 line 24-25); Bergmann (US 4821297) doesn't disclose that the phases of the three sampling clocks are arranged within an eye opening of the input data stream with a predetermined margin even that is inherited in his description. Hogge (US 4218771) discloses that the phases of the three sampling clocks are arranged within an eye opening of the input data stream with a predetermined margin (figure 2 and 3, column 3 line 49-51). Bergmann (US 4821297) and Hogge (US 4218771) teachings are analogous art because they are from the same field of endeavor. At the time of the invention it would have been obvious to a person of

ordinary skill in the art to incorporate the eye pattern disclosed by Hogge (US 4218771) with the recovery scheme disclosed by Bergmann (US 4821297). The suggestion/motivation for doing so would have been to establishing a late clock boundary condition and an early clock boundary condition (Hogge (US 4218771) column 2 lines 51-53).

As per claim 3 Bergmann (US 4821297) and Hogge (US 4218771) disclose claim 2. Bergmann (US 4821297) also discloses that the first circuit means and the second circuit means receive the first sampling clock (figure 1 and 6 block 16, column 3 line 22-26). Bergmann (US 4821297) and Hogge (US 4218771) teachings are analogous art because they are from the same field of endeavor. At the time of the invention it would have been obvious to a person of ordinary skill in the art to incorporate the eye pattern disclosed by Hogge (US 4218771) with the recovery scheme disclosed by Bergmann (US 4821297). The suggestion/motivation for doing so would have been to establishing a late clock boundary condition and an early clock boundary condition (Hogge (US 4218771) column 2 lines 51-53).

Claim 5 and 8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Bergmann (US 4821297) as applied to claims 1 and 6 above further in view of Hogge (US 4218771), and further un view of Epstein (US 3633115).

As per claim 5 Bergmann (US 4821297) discloses claims 1. Bergmann (US 4821297) also discloses a phase shifting means comprising a fixed local clock (crystal oscillator) to generate a plurality of phase delayed clock pulses controlled by a phase controlling means for outputting three sampling clocks by delaying the output of the

crystal oscillator. Hogge (US 4218771) teaches that the phases of the three sampling clocks are arranged within an eye opening of input data stream with a predetermined margin. Epstein (US 3633115) teaches a voltage controlled oscillator (VCO) that provides an output clock following the phase variation of an input clock (figure 1 column 1 lines 45-60). Bergmann (US 4821297), Hogge (US 4218771) and Epstein (US 3633115) teachings are analogous art because they are from the same field of endeavor. At the time of the invention it would have been obvious to a person of ordinary skill in the art that The VCO disclosed by Epstein (US 3633115) can substitute the crystal oscillator disclosed by Bergmann (US 4821297). The suggestion/motivation for doing so would have been to obtain a clock recovery system that can works in a greater margin of frequencies (Epstein (US 3633115) column 2 lines 47-49).

As per claim 8 Bergmann (US 4821297) discloses claims 6. Bergmann (US 4821297) also discloses a phase shifting means comprising a fixed local clock (crystal oscillator) to generate a plurality of phase delayed clock pulses controlled by a phase controlling means for outputting three sampling clocks by delaying the output of the crystal oscillator. Hogge (US 4218771) teaches that the phases of the three sampling clocks are arranged within an eye opening of input data stream with a predetermined margin. Epstein (US 3633115) teaches a voltage controlled oscillator (VCO) that provides an output clock following the phase variation of an input clock (figure 1 column 1 lines 45-60). Bergmann (US 4821297), Hogge (US 4218771) and Epstein (US 3633115) teachings are analogous art because they are from the same field of endeavor. At the time of the invention it would have been obvious to a person of

ordinary skill in the art that The VCO disclosed by Epstein (US 3633115) can substitute the crystal oscillator disclosed by Bergmann (US 4821297). The suggestion/motivation for doing so would have been to obtain a clock recovery system that can works in a greater margin of frequencies (Epstein (US 3633115) column 2 lines 47-49).

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Juan A. Torres whose telephone number is (571) 272-3119. The examiner can normally be reached on Monday-Friday 9:00 AM - 5:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mohammad H. Ghayour can be reached on (571) 272-3021. The fax phone

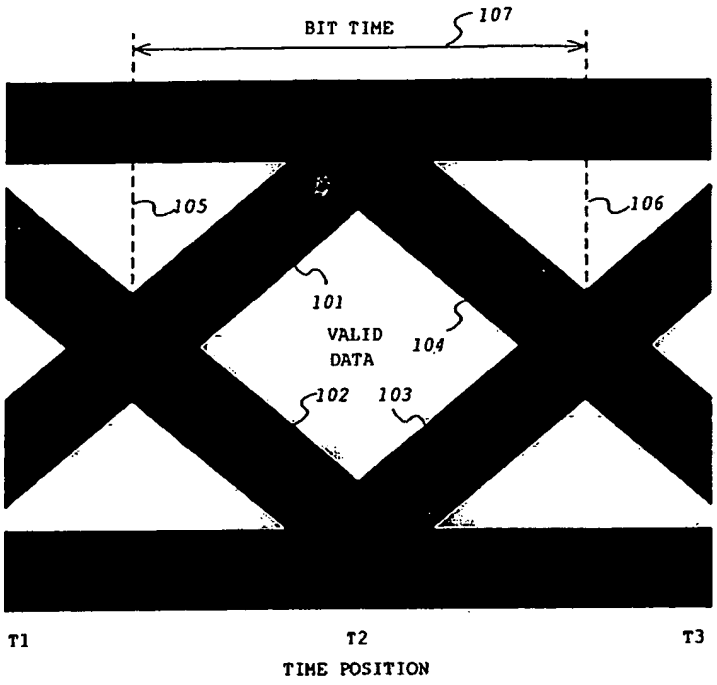
number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Juan Alberto Torres, Ph. D.
05-25-2005

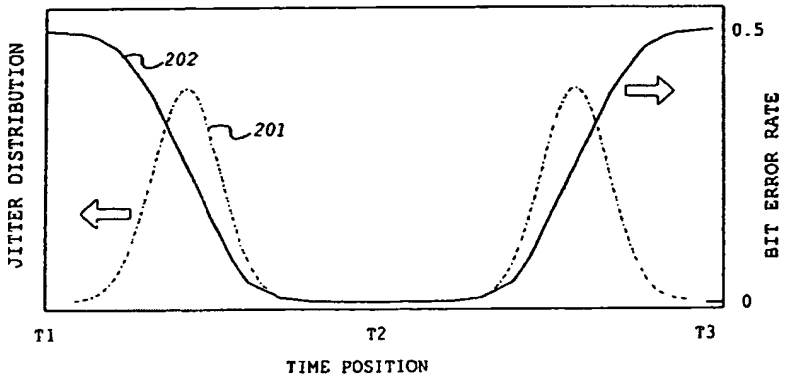
M. Ghayour

MOHAMMED GHAYOUR
SUPERVISORY PATENT EXAMINER



"PRIOR ART"

FIG. 1



"PRIOR ART"

FIG. 2

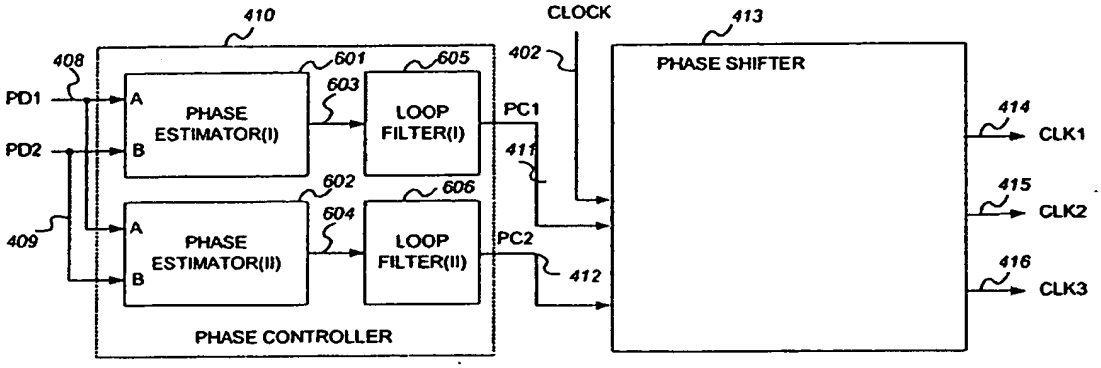


FIG. 6

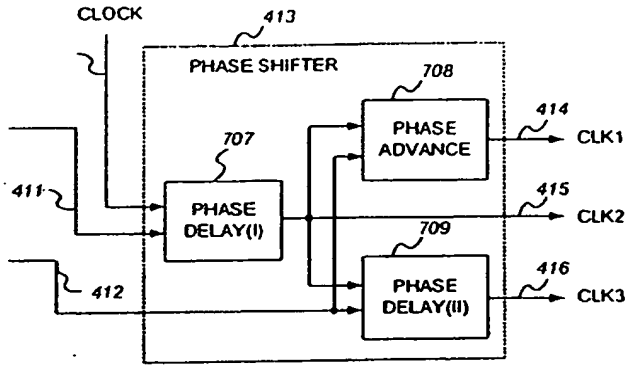


FIG. 7

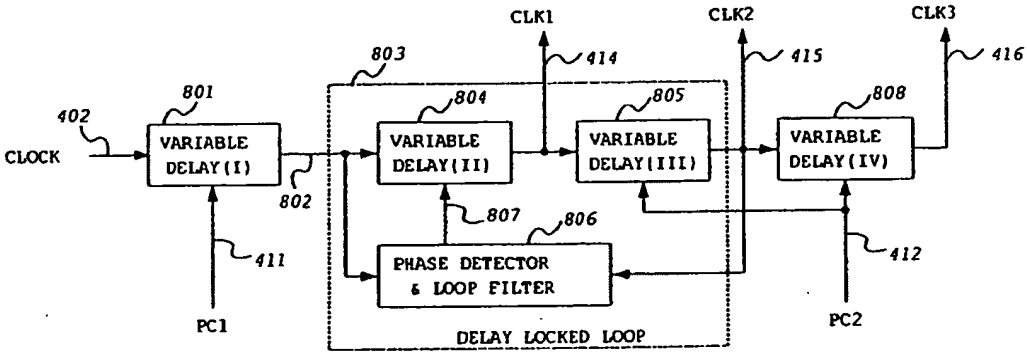


FIG. 8

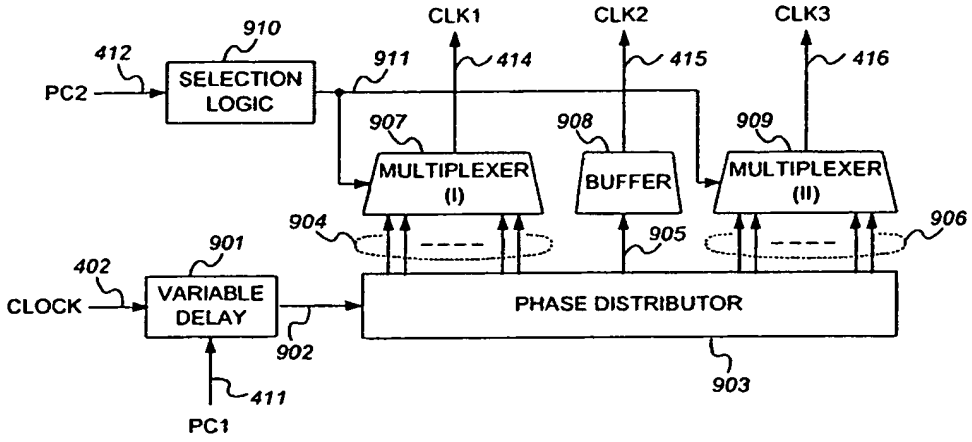

910
412
PC2
SELECTION LOGIC
911
CLK1
414
CLK2
415
CLK3
416
907
908
909
MULTIPLEXER (I)
BUFFER
MULTIPLEXER (II)
904
905
906
901
402
CLOCK
VARIABLE DELAY
902
PHASE DISTRIBUTOR
903
411
PC1

FIG. 9

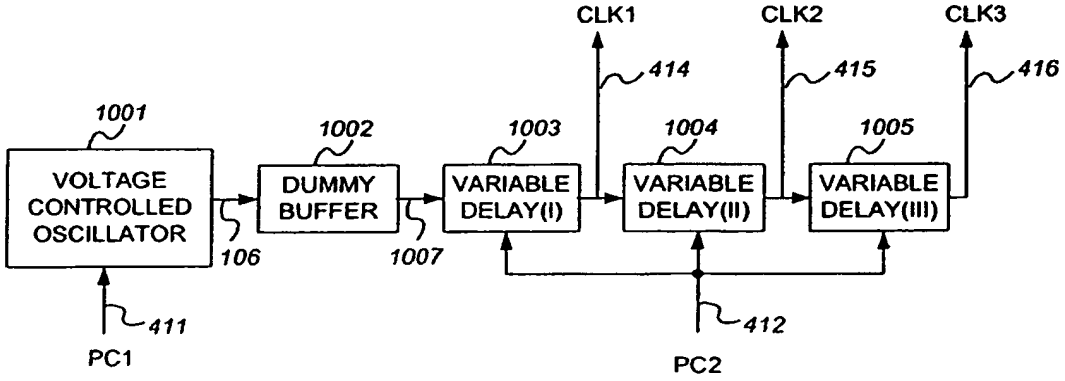

CLK1
414
CLK2
415
CLK3
416
1001
1002
1003
1004
1005
VOLTAGE CONTROLLED OSCILLATOR
DUMMY BUFFER
VARIABLE DELAY(I)
VARIABLE DELAY(II)
VARIABLE DELAY(III)
106
1007
411
PC1
412
PC2

FIG. 10

UNITED STATES PATENT AND TRADEMARK OFFICE

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/943,029	08/29/2001	Sang-Hyun Lee	19570-05384	9521

22918 7590 12/29/2004

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EXAMINER	
TORRES, JUAN A	
ART UNIT	**PAPER NUMBER**
2631	

DATE MAILED: 12/29/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/943,029	LEE ET AL.	
	Examiner	Art Unit	
	Juan A. Torres	2631	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *29 August 2001*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-9* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-9* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☒ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *11092004*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Drawings

The drawings are objected to because FIG. 6 and FIG. 9 have not been printed correctly (it seems that the printer didn't have enough memory and some details that are in the original graphic have not been printed in the hardcopy, sometimes this problem can be fixed reducing the quality of the graphic at the time of printing). FIG. 6 is objected because: line 415 is not shown. FIG. 9 is objected because: Line 911 is not shown; line connecting block 911 with block 909 is not shown; line connecting block 901 with block 903 is not shown; line connecting label 903 with block "PHASE DISTRIBUTOR" is not shown. Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. The replacement sheet(s) should be labeled "Replacement Sheet" in the page header (as per 37 CFR 1.84(c)) so as not to obstruct any portion of the drawing figures. If the changes are not accepted by the

examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Figures 1 and 2 should be designated by a legend such as --Prior Art-- because only that which is old is illustrated. See MPEP § 608.02(g). Corrected drawings in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. The replacement sheet(s) should be labeled "Replacement Sheet" in the page header (as per 37 CFR 1.121(d)) so as not to obstruct any portion of the drawing figures. If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Specification

Applicant is reminded of the proper language and format for an abstract of the disclosure.

The abstract should be in narrative form and generally limited to a single paragraph on a separate sheet within the range of 50 to 150 words. It is important that the abstract not exceed 150 words in length since the space provided for the abstract on the computer tape used by the printer is limited. The form and legal phraseology often used in patent claims, such as "means" and "said," should be avoided. The abstract should describe the disclosure sufficiently to assist readers in deciding whether there is a need for consulting the full patent text for details.

The language should be clear and concise and should not repeat information given in the title. It should avoid using phrases which can be implied, such as, "The disclosure concerns," "The disclosure defined by this invention," "The disclosure describes," etc.

The disclosure is objected to because of the following informalities:

The abstract exceed 150 words in length.

Page 1 line 2 should be deleted.

Page 13 paragraph [0033] line 3 block 411 is not shown in FIG. 7.

Page 14 paragraph [0036] line 8 the recitation "1002" is suggested to be change to "**1002**" in bold to maintain the general presentation of the disclosure.

Page 20 line 8 the recitation "circuit,controlled by" is suggested to be changed to "circuit, controlled by"

Appropriate correction is required.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claim 1, 4 and 6 are rejected under 35 U.S.C. 102(b) as being anticipated by Bergmann (US 4821297).

As per claim 1 Bergmann (US 4821297) discloses a data recovery apparatus for a digital data stream of input data, comprising: phase shifting means for outputting multiple sampling clocks in a bit time, where the phase of said sampling clocks are automatically adjustable (figure 6 blocks 16, 14 and 38, column 7 line 21-40); data sampling means for sampling the input data using the sampling clocks as triggers, and for providing multiple sampled data signals, where one of said sampled data signals is used to output recovered data (figure 6 blocks 32, 34 and 36, column 7 line 18-21); compare logic means for comparing said sampled data signals to said recovered data (figure 6 block 20, column 7 line 41-45); and phase controlling means for estimating the

phase relationship between the input data and said sampling clocks using the comparison result of said compare logic means, and for providing control signals to said phase shifting means according to said estimation result (figure 6 block 20, column 7 line 41-45).

As per claim 4 Bergmann (US 4821297) discloses a phase shifting means comprising: a phase distributor outputting a plurality of phase shift values (figure 6 block 38, column 7 line 21-40); a buffer receiving input from the phase distributor and outputting a first sampling clock in accordance with a first output of said phase controlling means (figure 1 and 6 block 14 and 38 output Φ_n, column 3 line 31-35); and selection logic receiving input from the phase distributor and outputting a second and third sampling clock in accordance with a second output of said phase controlling means (figure 6 block 38, column 7 line 21-22).

As per claim 6 Bergmann (US 4821297) discloses a data recovery apparatus for a digital data stream of input data, comprising: a phase shifter that outputs multiple sampling clocks in a bit time, where the phase of said sampling clocks are automatically adjustable (figure 6 block 38, column 7 line 22-40); a data sampler that samples the input data using the sampling clocks as triggers, and for providing multiple sampled data signals, where one of said sampled data signals is used to output recovered data (figure 6 block 32, 34 and 36, column 7 line 17-21); compare logic that compares said sampled data signals to said recovered data (figure 6 block 20, column 7 line 41-45); and a phase controller that estimating the phase relationship between the input data and said sampling clocks using the comparison result of said compare logic means, and

for providing control signals to said phase shifting means according to said estimation result (figure 6 block 38, column 7 line 41-45).

Claim 9 is rejected under 35 U.S.C. 102(b) as being anticipated by Hogge (US 4218771). Hogge (US 4218771) discloses a data recovery method for a digital data stream, comprising: sampling input data at multiple points, where said sampling points are arranged by a predetermined order and adjustable time difference (figure 3 block 23 column 3 lines 49-60); providing a first pseudo bit-error signal that is a result of comparison of data sampled at an early boundary with recovered data (figure 3 block 33 column 3 line 60-65); providing a second pseudo bit-error signal that is a result of comparison of data sampled at a late boundary with recovered data (figure 3 block 35 column 3 line 66 to column 4 line 2); and using the first and second pseudo bit-error signals, so that the sampling boundary is marginally matched to the edge of an eye opening and one of the intermediate sampling points serves for data recovery (figure 3 block 51 column 4 lines 3-13).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claim 2-3 and 7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Bergmann (US 4821297) as applied to claim 1 above, and further in view of Hogge (US 4218771).

As per claim 2 Bergmann (US 4821297) discloses claim 1. Bergmann (US 4821297) also discloses a phase shifting means comprising: phase delay means controlled by a first output of said phase controlling means for outputting a first sampling clock using an input clock which is one of an external clock and an internally recovered clock (figure 6 block 14, column 3 line 31-34); first circuit means controlled by a second output of said phase controlling means for outputting a second sampling clock that advances said first sampling clock in phase (figure 6 block 38, column 7 line 26-28); second circuit means controlled by the second output of said phase controlling means for outputting a third sampling clock that is delayed from said first sampling clock in phase (figure 6 block 20, column 7 line 24-25); Bergmann (US 4821297) doesn't disclose that the phases of the three sampling clocks are arranged within an eye opening of the input data stream with a predetermined margin even that is inherited in his description. Hogge (US 4218771) discloses that the phases of the three sampling clocks are arranged within an eye opening of the input data stream with a predetermined margin (figure 2 and 3, column 3 line 49-51). Bergmann (US 4821297) and Hogge (US 4218771) teachings are analogous art because they are from the same field of endeavor. At the time of the invention it would have been obvious to a person of ordinary skill in the art to incorporate the eye pattern disclosed by Hogge (US 4218771) with the recovery scheme disclosed by Bergmann (US 4821297). The suggestion/motivation for doing so would have been to establishing a late clock boundary condition and an early clock boundary condition (Hogge (US 4218771) column 2 lines 51-53).

As per claim 7 Bergmann (US 4821297) discloses claim 6. Bergmann (US 4821297) also discloses a phase shifting means comprising: phase delay means controlled by a first output of said phase controlling means for outputting a first sampling clock using an input clock which is one of an external clock and an internally recovered clock (figure 6 block 14, column 3 line 31-34); first circuit means controlled by a second output of said phase controlling means for outputting a second sampling clock that advances said first sampling clock in phase (figure 6 block 38, column 7 line 26-28); second circuit means controlled by the second output of said phase controlling means for outputting a third sampling clock that is delayed from said first sampling clock in phase (figure 6 block 20, column 7 line 24-25); Bergmann (US 4821297) doesn't disclose that the phases of the three sampling clocks are arranged within an eye opening of the input data stream with a predetermined margin even that is inherited in his description. Hogge (US 4218771) discloses that the phases of the three sampling clocks are arranged within an eye opening of the input data stream with a predetermined margin (figure 2 and 3, column 3 line 49-51). Bergmann (US 4821297) and Hogge (US 4218771) teachings are analogous art because they are from the same field of endeavor. At the time of the invention it would have been obvious to a person of ordinary skill in the art to incorporate the eye pattern disclosed by Hogge (US 4218771) with the recovery scheme disclosed by Bergmann (US 4821297). The suggestion/motivation for doing so would have been to establishing a late clock boundary condition and an early clock boundary condition (Hogge (US 4218771) column 2 lines 51-53).

As per claim 3 Bergmann (US 4821297) and Hogge (US 4218771) disclose claim 2. Bergmann (US 4821297) also discloses that the first circuit means and the second circuit means receive the first sampling clock (figure 1 and 6 block 16, column 3 line 22-26). Bergmann (US 4821297) and Hogge (US 4218771) teachings are analogous art because they are from the same field of endeavor. At the time of the invention it would have been obvious to a person of ordinary skill in the art to incorporate the eye pattern disclosed by Hogge (US 4218771) with the recovery scheme disclosed by Bergmann (US 4821297). The suggestion/motivation for doing so would have been to establishing a late clock boundary condition and an early clock boundary condition (Hogge (US 4218771) column 2 lines 51-53).

Claim 5 and 8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Bergmann (US 4821297) as applied to claims 1 and 6 above further in view of Hogge (US 4218771), and further un view of Epstein (US 3633115).

As per claim 5 Bergmann (US 4821297) discloses claims 1. Bergmann (US 4821297) also discloses a phase shifting means comprising a fixed local clock (crystal oscillator) to generate a plurality of phase delayed clock pulses controlled by a phase controlling means for outputting three sampling clocks by delaying the output of the crystal oscillator. Hogge (US 4218771) teaches that the phases of the three sampling clocks are arranged within an eye opening of input data stream with a predetermined margin. Epstein (US 3633115) teaches a voltage controlled oscillator (VCO) that provides an output clock following the phase variation of an input clock (figure 1 column 1 lines 45-60). Bergmann (US 4821297), Hogge (US 4218771) and Epstein (US

3633115) teachings are analogous art because they are from the same field of endeavor. At the time of the invention it would have been obvious to a person of ordinary skill in the art that The VCO disclosed by Epstein (US 3633115) can substitute the crystal oscillator disclosed by Bergmann (US 4821297). The suggestion/motivation for doing so would have been to obtain a clock recovery system that can works in a greater margin of frequencies (Epstein (US 3633115) column 2 lines 47-49).

As per claim 8 Bergmann (US 4821297) discloses claims 6. Bergmann (US 4821297) also discloses a phase shifting means comprising a fixed local clock (crystal oscillator) to generate a plurality of phase delayed clock pulses controlled by a phase controlling means for outputting three sampling clocks by delaying the output of the crystal oscillator. Hogge (US 4218771) teaches that the phases of the three sampling clocks are arranged within an eye opening of input data stream with a predetermined margin. Epstein (US 3633115) teaches a voltage controlled oscillator (VCO) that provides an output clock following the phase variation of an input clock (figure 1 column 1 lines 45-60). Bergmann (US 4821297), Hogge (US 4218771) and Epstein (US 3633115) teachings are analogous art because they are from the same field of endeavor. At the time of the invention it would have been obvious to a person of ordinary skill in the art that The VCO disclosed by Epstein (US 3633115) can substitute the crystal oscillator disclosed by Bergmann (US 4821297). The suggestion/motivation for doing so would have been to obtain a clock recovery system that can works in a greater margin of frequencies (Epstein (US 3633115) column 2 lines 47-49).

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Juan A. Torres whose telephone number is (571) 272-3119. The examiner can normally be reached on Monday-Friday 9:00 AM - 5:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mohammad H. Ghayour can be reached on (571) 272-3021. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

JAT 12-2-2004

M. G

MOHAMMED GHAYOUR
SUPERVISORY PATENT EXAMINER

controlled by--. Withdrawal of the specification objections is respectfully requested.

REJECTIONS UNDER 35 U.S.C. § 102(b)

Claims 1, 4 and 6 were rejected under 35 U.S.C. § 102(e) as being anticipated by Bergmann (U.S. Patent No. 4,821,297). Claim 9 was rejected under 35 U.S.C. § 102(e) as being anticipated by Hogge (U.S. Patent No. 4,218,771). Applicant respectfully traverses for the following reasons, but reserves the right to swear behind these references at a later date.

Bergman apparently discloses a digital clock recovery scheme. Included is reference clock used to provide a plurality of N signals with different clock phases. The incoming data stream is sampled and clocked with the reference clock to generate a plurality of M samples for each data bit. The logic values of the M samples are then analyzed to determine the relationship between the current clock phase and the data bit transition. If all samples agree, the clock phase is perhaps aligned with the data. If the clock phase is either leading or lagging the data, various samples will disagree. In the latter situation, the clock phase is adjusted until all samples agree, the particular clock which provides this state thus being defined as the recovered clock signal.

Hogge apparently discloses an automatic clock positioning circuit for positioning a clock pulse for a digital data stream that resembles an eye pattern when seen on an oscilloscope in response to digital data when the sweep is equal to the baud, bit or clock rate. Included in the circuit is a timing source for providing a stream of clock pulses and a controllable phase shift means electrically connected to said timing source and in response to an error signal will

either advance, delay or maintain the phase of said stream of clock pulses. Also included is a pseudo-error indicator means for providing an upper, lower, early and late boundary condition within the center of the eye pattern of the digital data stream and providing a first pseudo-error signal for each violation of the upper or lower boundary condition by the eye pattern at the early boundary condition and a second pseudo-error signal for each violation of the upper and lower boundary condition at the late boundary of the eye pattern, means for integrating the first and second error signals, means for comparing the integrated first error signal with the integrated second pseudo-error signal providing an error correcting signal; and means for controlling the controllable phase shift means with the error connecting signal.

Aspects of the claimed embodiment are directed to methods and systems for data recovery for a digital stream of input data such that a plurality of sampling clocks are employed to maintain optimal placement of a 'valid data' region within an eye opening that results from a superposition of multiple data transitions. Each sampling clock of the plurality of sampling clocks is independently and automatically adjusted to maintain optimal placement of the valid data region. For example, the valid data region may need to only be adjusted on the left side due to an asymmetrical jitter distribution. Instead of adjusting the entire valid data region, which would result in the right side of the region being too far over, just a sampling clock that defines the left boundary would be adjusted. This process can also be done for the right boundary or for both boundaries at the same time. Advantageously, the claimed embodiment allows for adjustment of the valid data region, as defined by a leading and trailing clock, as the shape of the jitter distribution changes as well as mere shifts of the center of the distribution to the left or right. This unique behavior of the

claimed embodiment is succinctly described in Applicant's specification at page 10, lines 3-20 and is reproduced here for the Examiner's convenience:

> **"The term `predetermined margin` indicates that the phases of `CLK1` and `CLK3` do not exactly coincide to the edge of the data eye. The data eye is related to the probabillistic distribution of jitter. Furthermore, the phase controller has a low pass filter, which makes the phases of `CLK1` and `CLK3` determined by the past history of random jitters on the data.**
>
> **[0028] In the present invention, `CLK2` 308 is controlled by a phase control signal that is determined from the difference of the bit-error-rate measured at `CLK1` 307 and the one measured at `CLK3` 309. `CLK1` 307 and `CLK3` 309 are advanced and delayed from `CLK2` 308 by the time difference of `TM` 310, respectively. The time difference `TM` 310 is controlled by another phase control signal that is determined from the summation of the two bit-error-rate. If bit-error-rate at `CLK1` 307 is greater than the one at `CLK3` 309, it means that the overall sampling phase leads the eye opening. Therefore, the phase of `CLK2` 308 is delayed until the two bit-error-rate becomes equal. On the contrary, if the bit-error-rate at `CLK1` 307 is smaller, the phase of `CLK2` 308 is advanced. If the sum of the two bit-error-rate exceeds a predetermined value, `TM` 310 is decreased to shrink the sampling window to the eye opening. If the sum is less than predetermined value, `TM` 310 is increased."**

In marked contrast, both Bergman and Hogge disclose methods of maintaining an optimal clock position in an eye of a jitter distribution via fixed valid data regions. That is, the leading and trailing sample clocks that define the valid data region are pre-defined at a set and equal distance on either side of the data clock. If the valid data region, or conversely the eye opening moves, to either side then both Bergman and Hogge will make an adjustment of the valid data region as a whole in the appropriate direction to correct the phase

imbalance. Disadvantageously, both Bergman and Hogge are simply not capable of adjusting the size of their valid data region.

To further illustrate, Applicant respectfully draws the attention of the Examiner to Bergmann, column 3, line 63 to column 4, line 17 that is reproduced here:

> **"Referring to FIG. 2, a timing diagram is shown of incoming data. The clock signal is represented by the vertical lines. The locations of RD1, RD2, and RD3 for each data bit are indicated by their respective numerals in FIG. 2. For this particular example, RD1 may represent the 10% interval of the data bit, RD2 the 50% interval, and RD3 the 90% interval. Other interval values for RD1 and RD3 may be used, for example, 25% and 75%, respectively. In accordance with the teachings of the present invention, however, the middle sample value must be chosen at or near the 50% interval since this position of the data bit will most likely represent the correct data bit value, regardless of the initial misalignment of the clock. Therefore, RD2 is utilized as the retimed data output of recovery arrangement 10. For the particular situation illustrated in FIG. 2, data samples RD1, RD2 and RD3 will always be identical in value, since the phase of the clock is correctly synchronized with the data stream. That is, the RD1-RD2-RD3 inputs to decision circuit 18 will either be " 1-1-1" or "0-0-0." Provided with this input, decision circuit 20 will transmit a "no change" output signal to phase selector 22."**

Bogge's out of phase alignment system is dependent on the spacing of the "RD" marks in the timing diagram. Alignment is achieved when a specific pattern is detected. The "RD" marks can perhaps be adjusted but then that would perhaps require the pattern to be changed accordingly to properly detect alignment. The spacing of the RD marks are not automatically changed in response to a change in the width of the timing pulses.

Hogge also discloses a similar type of system that is dependent on the eye pattern moving out of a specified and fixed window such as that described by Hogge at column 3, lines 36-48:

> **"There is established an upper boundary condition 16 and a lower boundary condition 17 in the eye pattern. The timing pulses .tau..sub.2 as shown by waveform 7 in FIG. 1 establish the early boundary condition 19 while the delayed boundary condition 20 is established by the delayed timing pulses .tau..sub.1 of waveform 11 of FIG. 1. Under ideal conditions, the clock or timing pulses associated with each data bit will occur in the center of the eye pattern. However, when a side 14a, 14b, 14c or 14d of the eye pattern crosses the boundary conditions established by the upper boundary 16, the lower boundary 17, the early clock pulse .tau..sub.2 at 19 or the late clock pulse .tau..sub.1 at 20, then a pseudo-error occurs."**

Bogge specifies that the eye pattern is out of alignment when the upper boundaries 16 and 17 intersects with eye pattern boundaries 14a, 14b, 14c or 14d. No disclosure is made of adjusting these various boundaries in response to a change in the shape of the eye pattern.

Claim 4 depends directly from independent claim 1 and is allowable at least for the reasons set forth for that independent claim. Withdrawal of the rejections of claims 1, 4, 6 and 9 is respectfully requested.

REJECTIONS UNDER 35 U.S.C. § 103(a)

Claims 2-3 and 7 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Bergmann in view of Hogge. Claims 5 and 8 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Bergmann in view of Hogge and further in view of Epstein (U. S. Patent No. 3,663,115).

Bergmann and Hogge were previously summarized. Epstein apparently discloses a digital voltage controlled oscillator ("VCO") to produce an output clock having a given repetition frequency comprising a source of the input clock, first means to generate a local clock having a repetition frequency equal to a given multiple L of the nominal value of said given repetition frequency and to generate at least a first timing signal having a given activation interval wherein L is an integer of one. Also included is a second means coupled to the first means responsive to the local clock and to the first timing signal to produce the output clock. The VCO further includes a third means coupled to the source, the first and second means responsive to the first timing signal and the phase relation between the input clock and the output clock to control the production of the output clock to follow the phase variation of the input clock.

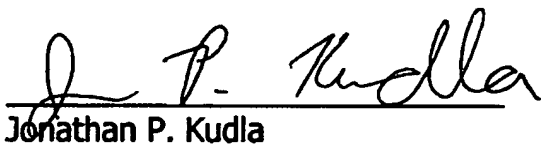
Since claims 2-3, 5 and 7-8 from independent claims 1 and 6, Applicant respectfully submits that these claims are also allowable at least for the reasons put forth in the previous section. Withdrawal of the rejections of claims 2-3, 5 and 7-8 is respectfully requested.

CONCLUSION

Applicant believes that all pending claims are allowable and a Notice of Allowance is respectfully requested. The amendment was made to expedite the prosecution of this application. Applicant respectfully traverses the rejections of the amended claims and reserves the right to re-introduce them and claims of an equivalent scope in a continuation application.

If the Examiner believes that a conference would be of value in expediting the prosecution of this application, he is cordially invited to telephone the undersigned counsel at the number set out below.

Respectfully submitted,
PERKINS COIE LLP



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